CHAPTER 8

TOTAL ARMY INJURY AND HEALTH OUTCOMES DATABASE: A MODEL COMPREHENSIVE RESEARCH DATABASE

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Figures

Section I. Description of the Total Army Injury and Health Outcomes Database

8-1. Introduction

The impact of injuries on the mission, readiness, and budget of the U.S. Armed Forces is dramatic. To uncover the complete spectrum of injury morbidity and mortality among service members, the U.S. Army Research Institute of Environmental Medicine (USARIEM) developed the Total Army Injury and Health Outcomes Database (TAIHOD). The creation of the TAIHOD was the initial action of USARIEM's protocol OMD95001-AP-H001, "The Impact of Injuries on the Health and Readiness of Women in the Army from 1980-1994." This protocol, approved in December 1994, was designed to investigate injuries among women in the Army over a 15-year period by combining existing personnel and medical outcomes data from various Army and DoD sources into a single relational database.

The TAIHOD is a versatile system that joins multiple personnel and health data sets from six separate DoD agencies. Each agency, at the request of USARIEM, created a data set that included only active duty Army soldiers. These data sets were then transferred to a single high-capacity computer server at USARIEM.

8-2. Mission

The U.S. Army Medical Research and Materiel Command (USAMRMC) manages and executes a worldwide research and development (R&D) mission aimed at military medical problems of importance to national defense. The medical R&D programs within the command provide data and materiel necessary to protect, maintain, or restore the health of the individual service member. At USARIEM, a subordinate command of USAMRMC, the Military Performance Division conducts epidemiological studies of injuries among Army personnel.

8-3. Purpose of the TAIHOD

The purpose of this relational database is to:

- Join multiple personnel, administrative, and health data sets for epidemiological research.
- Use the soldiers' encrypted social security numbers as a key to link three general categories of data:
  - Demographics (the parameters for the denominator).
  - Outcomes (hospitalizations, lost time injuries, permanent disabilities, and fatalities).
  - Self-reported health habits and risk-taking behavior from surveys.

In turn, USARIEM's research epidemiologists use TAIHOD to directly link Army personnel records and self-reported health habits to specific health outcomes, and to trace the interrelationship of these outcomes over time. Using carefully structured data queries, the database supports epidemiological health research in injury control, occupational hazards, health promotion, and disease prevention.

8-4. Authority

By Section 6, General Order No. 33, Department of the Army, 20 September 1961, and General Order No. 40, Office of The Surgeon General, 1 December 1961, USARIEM was established a Class II medical activity.

8-5. Contents of Database

Each individual data component in the TAIHOD offers an excellent source of data for study. In addition, the ability to link all of these data components at the level of the individual soldier provides a truly extraordinary opportunity for research. The TAIHOD represents a versatile system that thus far integrates six master databases:

- Personnel data archived by the Defense Manpower Data Center (DMDC), Seaside, California.
- The Individual Patient Data System (IPDS) maintained by the Directorate of Patient Administration System and Biostatistics Activity (PASBA), Fort Sam Houston, Texas.
- The Army Safety Management Information System (ASMIS) maintained by the U.S. Army Safety Center, Fort Rucker, Alabama.
- Army disability data maintained by the Physical Disability Case Processing System, WRAMC, Washington, D.C.
- The Army Casualty Information Processing System (ACIPS) maintained by the Army Casualty Office, Alexandria, Virginia, as well as the complete database of the WHS, DIOR, Washington, D.C.
- The Health Risk Appraisal (HRA) Data Set maintained by the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Aberdeen Proving Ground, Maryland.

Table 8-1 presents a summary of the data collected within each of the six current master databases, and illustrates how the atlas demonstrates the use of these administrative databases for both injury surveillance and epidemiologic study. The TAIHOD system, born of the efforts of the DoD Injury Surveillance and Prevention Work Group, is capable of leveraging these data sources well beyond their primary purpose. The ability to link records from the respective databases at the level of the soldier creates a truly exponential benefit for epidemiological inquiry.

Table 8-1. The TAIHOD's Six Master Databases: A Summary of Data Collection

Databases	Types of Data	Records			Unique Individuals*			Summary
		Total No.	% Women	% Men	Total No.	% Women	% Men	
DMDC, CY 1980-1998	**Personnel** • Demographic Variables • Hazardous Duty Pay • Service Dates • Reason for Discharge • Gulf War Deployments	27,497,400	11.1	88.9	2,789,800	12.5	87.5	The TAIHOD currently integrates personnel records on all current and former active duty Army soldiers (CY 1980-1998). • This cohort now represents over 2.7 million people; about 12% are women and over 7% are minority women. • The addition of health habit surveys adds a behavioral component to this process, providing another powerful dimension to the research capability of the TAIHOD. The ability to link comprehensive demographic and occupational data to specific health outcomes, at the individual level, allows evaluation of injury and illness risk based on individual soldier attributes, habits, and exposures.
IPDS, CY 1980-1998 *Note: Chapter 5 of the Atlas used data from the IPDS.*	**Hospitalization** • Diagnoses • Injury Type/Cause • Bed Days • Non-Army Hospitalizations	1,745,300	24.9	75.1	944,800	19.5	80.5	
ASMIS, CY 1980-1998 *Note: Chapter 3 of the Atlas used data from the ASMIS.*	**Lost-Time Injury** • Unintentional Aviation Incidents • Unintentional Ground Incidents • Event Specific Information	5,000 127,400	1.6 6.7	98.4 93.3	1,600 120,400	1.7 6.8	98.3 93.2	
Army Disability, CY 1980-1997 *Note: Chapter 4 of the Atlas used data from the Army disability database.*	**Disability** • Percentage of Disability • Functional Disability (VASRD) Codes • Line-of-Duty Relationship • Case Outcomes	137,000	13.4	86.6	105,000	13.4	86.6	
ACIPS, CY 1980-1997 *Note: Chapter 2 of the Atlas used data from the ACIPS and WCS.*	**Casualty** • Event Specific Information • Cause of Death	10,900	5.6	94.4	—	—	—	

Table 8-1.—*Continued*

Databases	Types of Data	Records			Unique Individuals*			Summary
		Total No.	% Women	% Men	Total No.	% Women	% Men	
HRA, CY 1989-1997	**Health Risk** • Self-Reported Health Habits • Physiological Measurements	514,800	13.6	86.4	403,800	13.7	86.3	

* A person who is now or has been on active duty. A unique individual may have any number of records.

8-6. The TAIHOD's Master Databases

The Defense Manpower Data Center Personnel Data.

The core of the TAIHOD is the DMDC data set, which includes over 27 million soldier records and serves primarily to isolate subpopulations for study and provide demographic control variables. The DMDC loss files also contain service discharge codes—important outcome variables.

Types of personnel data include:

- **Demographic.** Demographic variables (such as age, gender, race, ethnic group, rank, unit, zip code, marital status, number of dependents, home of record, military occupational specialty (MOS), education level, total months in Federal service, aptitude test scores, induction height and weight, and barracks or other housing status) are available on most Army service members. This information may be linked with any of the other five current database components. To maintain confidentiality, the social security numbers are scrambled and all names are eliminated from the TAIHOD database.
- **Pay.** Separate pay files for hazardous duty that address parachuting, flying, diving, combat, hostile fire, and environmental stress allow identification and analysis of these high-risk groups.
- **Loss.** Loss files were obtained for the entire interval, allowing precise determination of each member's date of arrival and departure from the Army. The loss files include codes for the reason for discharge (e.g., retirement, misconduct, end of tour, drug or alcohol, pregnancy, etc.).
- **Gulf War.** Active duty deployment status as well as Army Reserve and National Guard activation/deployment during the Gulf War are contained in the database, as well as data on other Army Reserve and National Guard soldiers on active duty.

Figure 8-1 illustrates types of personnel data, number of records, and number of unique individuals associated with the DMDC data for CY 1980-1998.

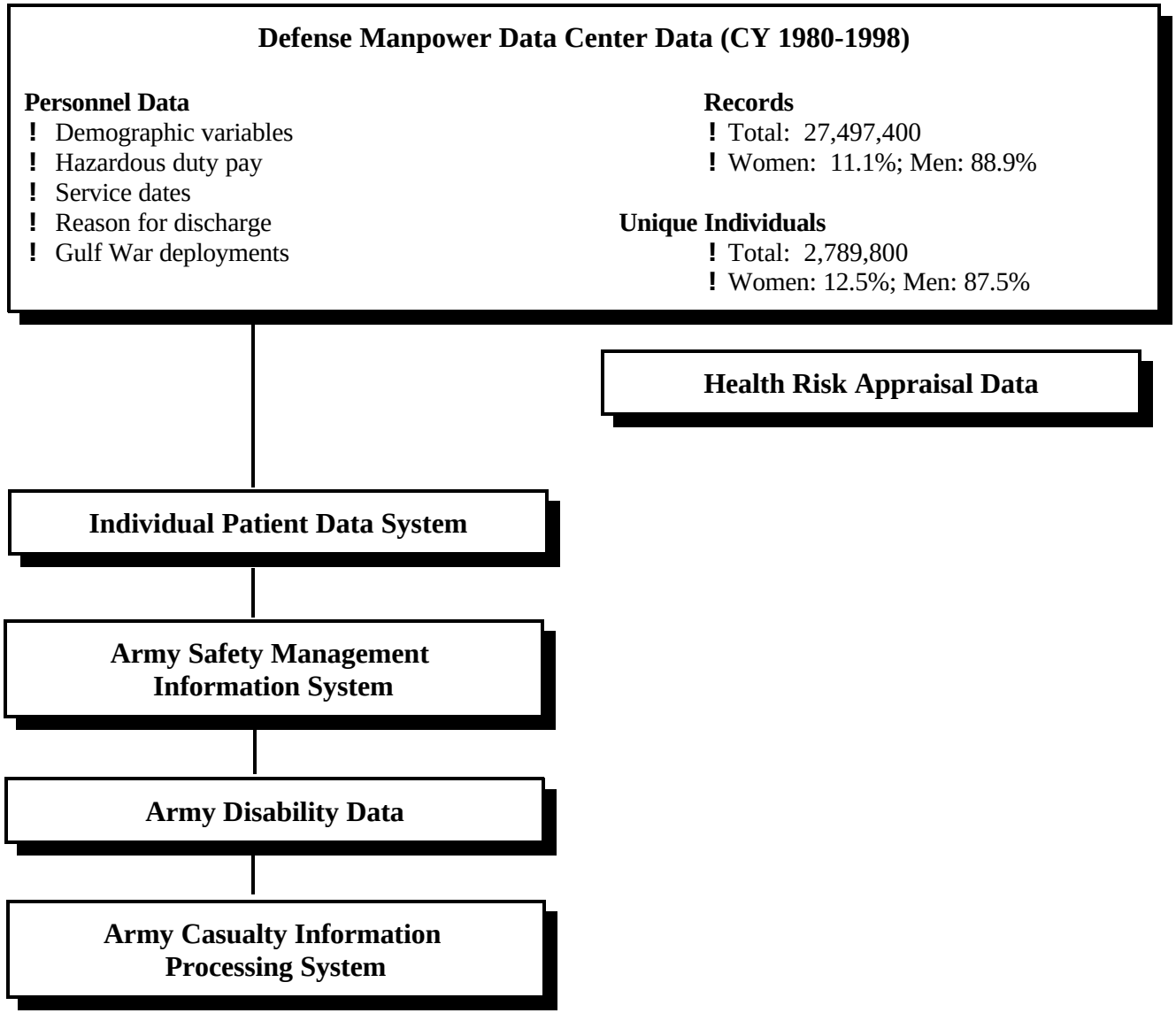

Figure 8-1. Defense Manpower Data Center Personnel Data, CY 1980-1998

The Individual Patient Data System.

The IPDS initially provided approximately 1.7 million hospitalization records covering all Army personnel admitted to Army medical treatment facilities and civilian hospitals from CY 1980-1994. Although the IPDS was not specifically implemented for the purpose of injury surveillance or prevention, its comprehensive, highly standardized record system makes it an especially useful tool for injury and health research. The presence of an extensive cause-of-injury coding system, and the ability to track readmission and calculate lost-duty time due to hospitalization gives this data exceptional power. The IPDS data include:

- **Diagnoses.** Using standard methods, specific discharge diagnoses were abstracted from the medical record and then coded according to standard ICD-9 coding (see Appendix A, Table A-3). Up to eight diagnoses and procedures are recorded for each discharge.
- **Injury Type/Cause.** The Army does not use the ICD system for coding cause of injury. Instead, the STANAG 2050 coding system is used (see Appendix A, Table A-1). The cause-of-injury codes are available on virtually 100 percent of all soldiers hospitalized for injury. These three-part codes classify not only the activity at the time of injury, but also intent and location. The level of coding (100 percent) inherent in this system is unmatched by any other U.S. civilian hospital system, even among states that have mandates for cause-of-injury coding.
- **Bed Days.** The IPDS captures the number of days on the hospital rolls (i.e., in a hospital bed or on convalescent leave).
- **Non-Army Hospitalizations.** Active duty Army soldiers hospitalized in civilian hospitals are also included (absent sick cases). Records of Army personnel hospitalized in Navy and Air Force facilities are obtained from another source. Army soldiers hospitalized in civilian hospitals comprise approximately 3% of the total hospitalizations.

Figure 8-2 illustrates types of hospitalization data, total number of records, and number of unique individuals associated with the IPDS for CY 1980-1998.

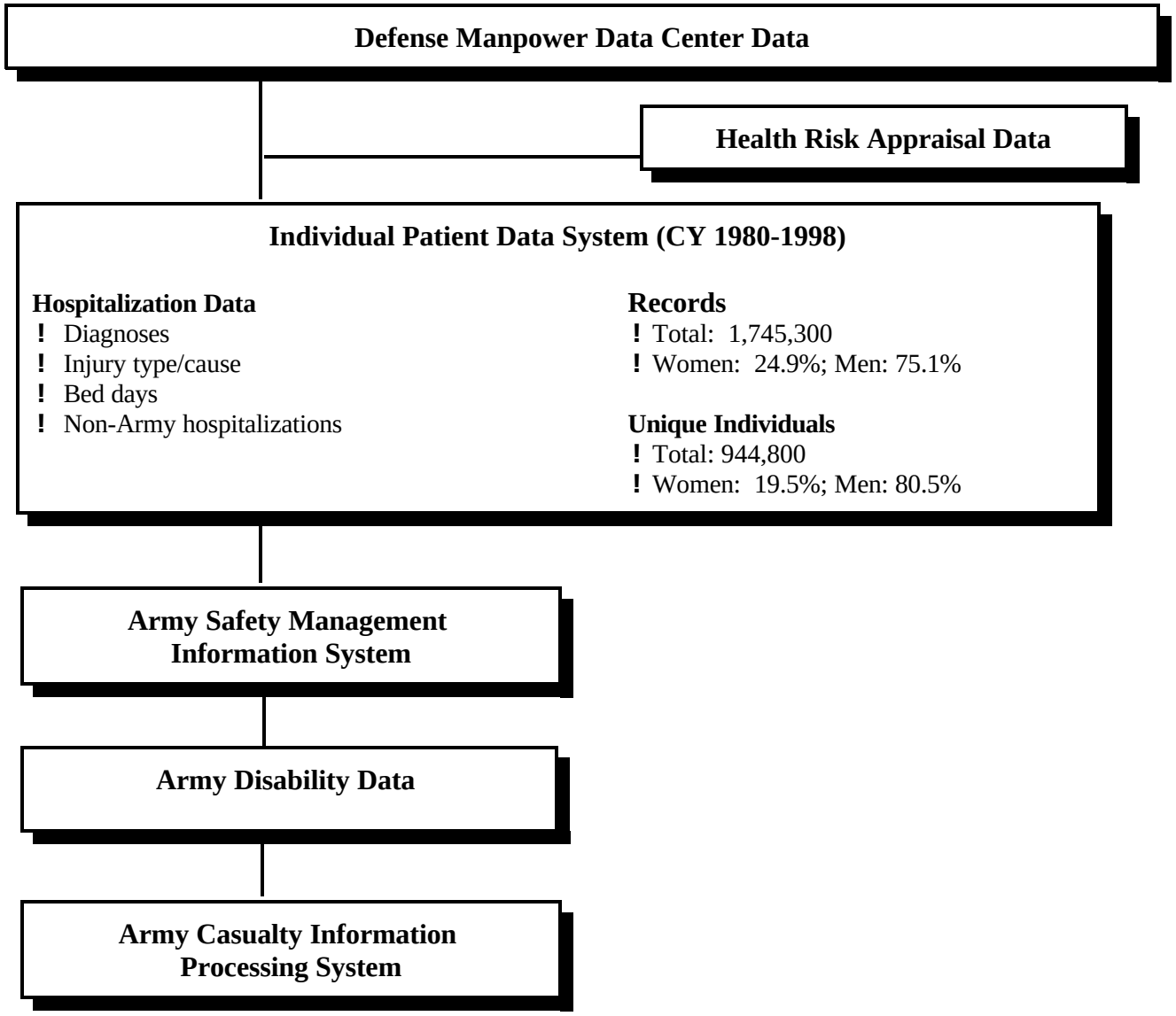

Figure 8-2. Individual Patient Data System, CY 1980-1998

The Army Safety Management Information System.

The ASMIS contains cause and activity data on almost 133,000 ground and aviation accidents describing equipment, weapons systems, and vehicles involved in crashes. Additional data on many hospital and fatality cases are also available. This database also contains cases not serious enough to require hospitalization and, therefore, provides a crucial, detail rich window to injuries not requiring hospitalization.

Types of lost-time injury data include:

- **Unintentional Aviation Incidents.** The variables include aircraft type, body part injured, injury type (fracture, sprain, etc.), date of injury, place of occurrence, severity of injury, days of limited duty, and an estimate of injury and incident cost.
- **Unintentional Ground Incidents.** The variables include activity at time of injury, body part injured, injury type (fracture, sprain, etc.), date of injury, place of occurrence, severity of injury, days of limited duty, and an estimate of injury and incident cost.
- **Event Specific Information.** The variables in this category describe other characteristics of the incident including personal protective equipment use, drug use, environmental conditions, and up to 500 words of free text describing the event.

Figure 8-3 illustrates types of lost-time injury data, total number of records, and number of unique individuals associated with the ASMIS for CY 1980-1998.

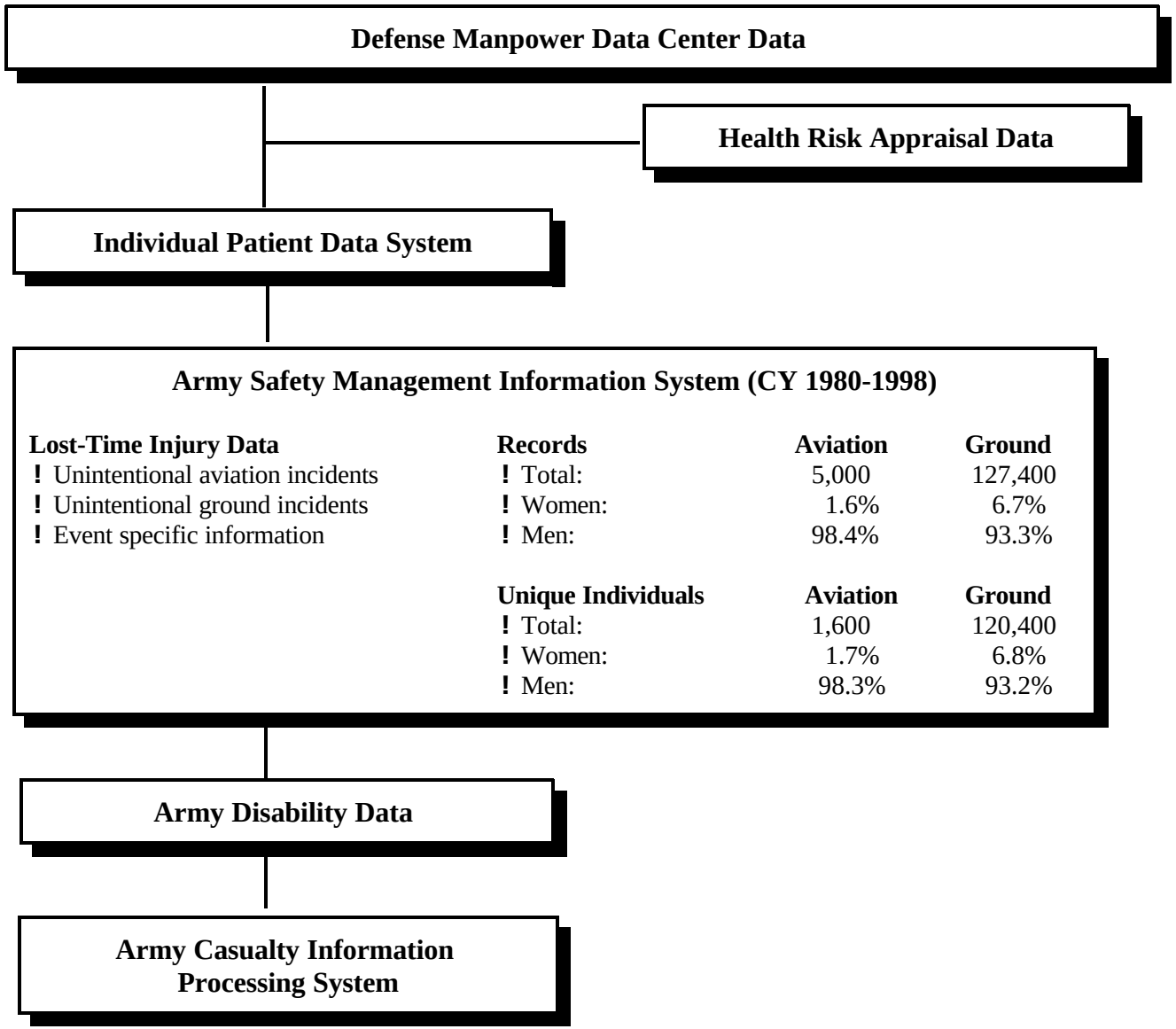

Figure 8-3. Army Safety Management Information System, CY 1980-1998

The Army Disability Data Set.

The Army Disability Data Set provides records on 105,000 disability board cases with functional disability ratings according to the VASRD (see Appendix A, Table A-2). When linked to the other TAIHOD components, hospital ICD-9 codes as well as career statistics can be evaluated. The ability to link hospital records to disability cases is yet another unique strength of the TAIHOD.

Types of disability data include case-specific information such as:

- **Percentage of Disability.** All disability cases (unless found fit) are assigned a percentage of disability, which is related to ability to perform duties (0-100% disabled) and is a significant factor in the determination of financial compensation, if any.
- **Functional Disability (VASRD) Codes.** Indicates VASRD code assigned to the case.
- **Line-of-Duty Relationship.** Indicates whether disability was deemed to be service connected or not.
- **Case Outcomes.** Indicates type of discharge or whether individual was returned to duty.

Figure 8-4 illustrates types of disability data, total number of records, and number of unique individuals associated with the disability database for CY 1980-1997.

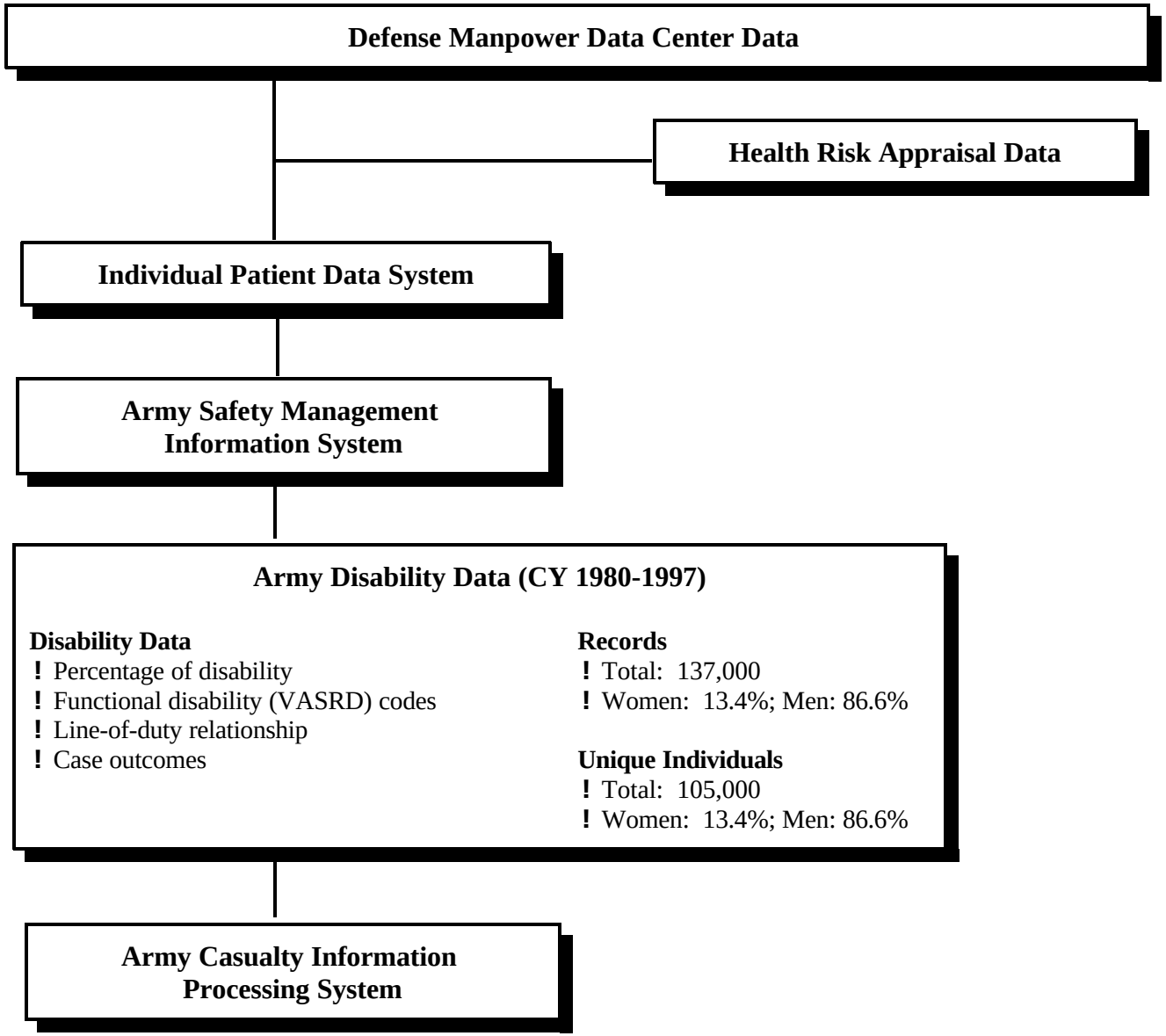

Figure 8-4. Army Disability Data, CY 1980-1997

Army Casualty Information Processing System.

The ACIPS provides data on the cause, time, and place of death on almost 11,000 Army active duty soldiers. The entire DIOR (WCS) database is also contained in the TAIHOD. By linking casualty data to safety and hospitalization data, researchers can conduct very elaborate fatality studies. Researchers can also evaluate many risk factors for injury fatalities by accessing data on self-reported health habits and risk-taking behavior.

Types of casualty data include:

- **Event-Specific Information.** Variables include the time and place the event occurred, general casualty code (accident, illness, etc.), and specific circumstances codes.
- **Manner of Death.** Casualties are categorized as an accident, hostile action, homicide, illness, missing, determination pending, suicide, terrorist activity, or unknown. Specific cause of death is not given.

Figure 8-5 illustrates the types of casualty data, total number of records, and number of unique individuals associated with ACIPS for CY 1980-1997.

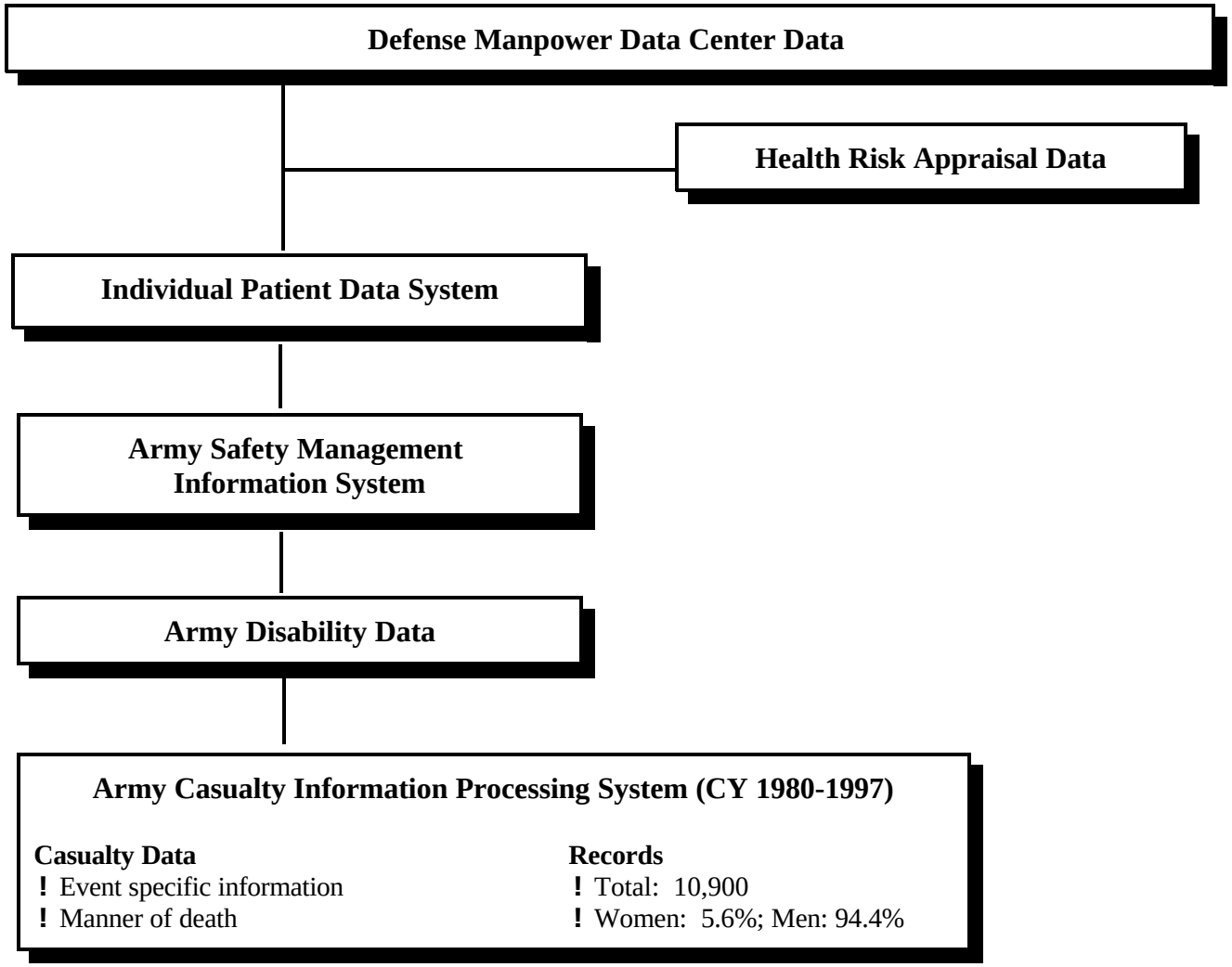

Figure 8-5. Army Casualty Information Processing System, CY 1980-1997

The Health Risk Appraisal Data.

The HRA data set includes well over 500,000 surveys administered by the Army. The survey is given in a variety of settings including unit inprocessing, periodic physical exams, unit physical fitness testing, occupational health screenings, and by command direction such as predeployment. (A copy of the survey is included as Appendix H in the USARIEM Report No. TN97-2, TAIHOD: Description and Capabilities, 21 Feb 97.)

More than 500,000 of these surveys are linked to the Army DMDC personnel files. The HRA data include self-reported health habits such as diet, exercise, tobacco and alcohol use, stress levels, job satisfaction, and risk-taking behavior. By analyzing this information against other TAIHOD files for the same Army subpopulations, researchers can determine the relationship between health habits and the incidence of injury and illness. The HRA data also include physiologic measures of health which can be assessed for their relationship with the occurrence of injury or illness.

Types of health risk data include:

- **Self-reported Health Habits.** Some representative variables include dietary habits, smoking habits, weight, physical activity, and alcohol use.
- **Physiological Measurements.** Certain HRA screenings include an EKG, blood pressure, and/or serum lipid and blood sugar determinations.

Figure 8-6 illustrates types of health risk data, total number of records, and number of unique individuals associated with HRA for CY 1989-1997.

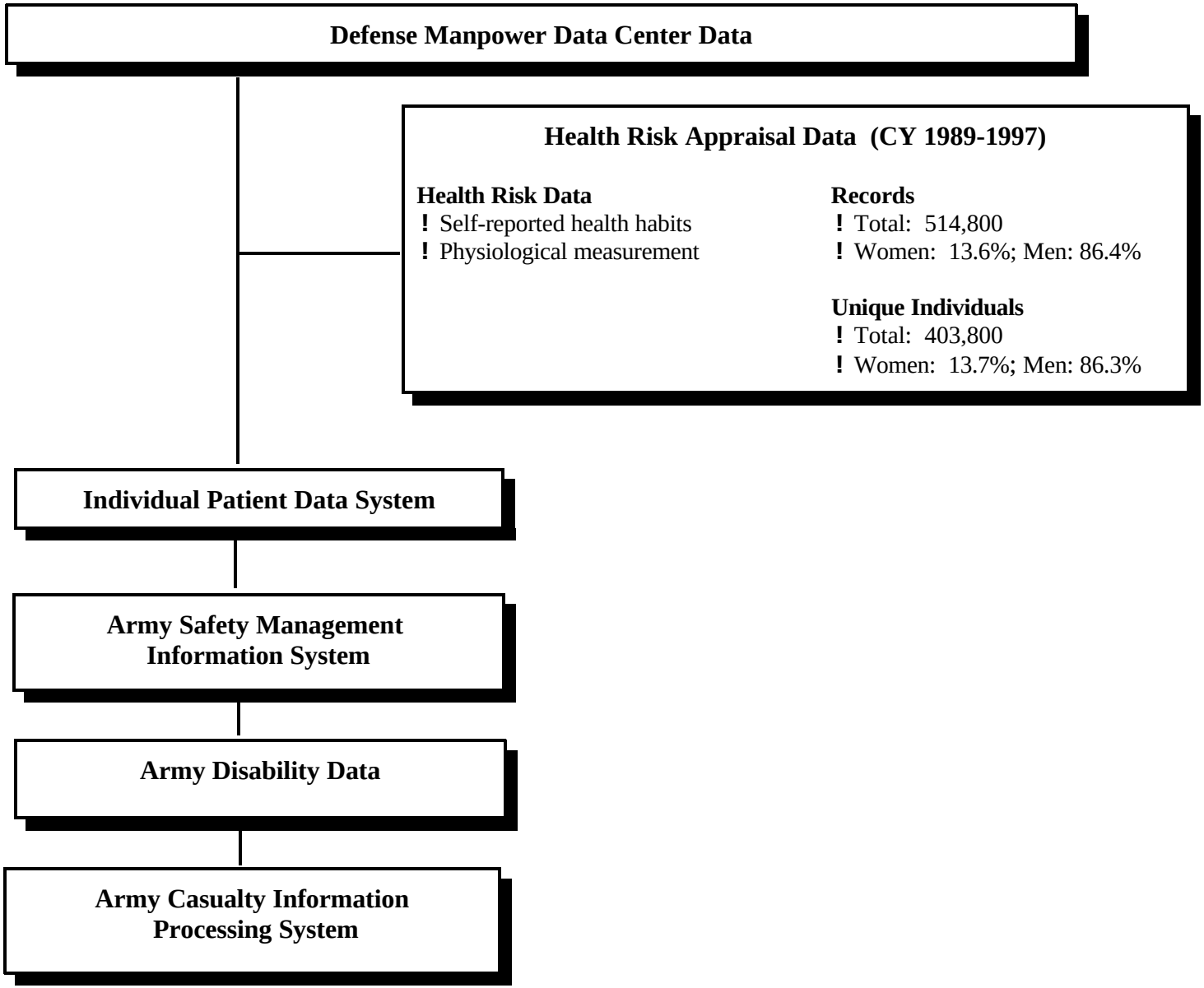

Figure 8-6. Health Risk Appraisal, CY 1989-1997

Section II. Application of the Total Army Injury and Health Outcomes Database

8-7. Structured Data Inquiries

Carefully structured data queries using the TAIHOD support epidemiological health research in injury control, occupational hazards, health promotion, and disease prevention. By linking information from various TAIHOD databases, researchers can:

- Investigate problems.
- Recommend solutions.
- Help management resolve important health issues.

The following actual inquiries illustrate the usefulness of the TAIHOD in various types of epidemiological health research.

NOTE: The following four examples link personnel and/or HRA data to hospitalization and death files. Similar analyses can also be done using disability and/or lost-time from work injury data as the outcomes of interest.

Perhaps the most powerful analyses of all will examine outcomes from particular Army subpopulations using multiple TAIHOD database components. An example of this might be the potential value added in the study of fatalities using not just the casualty files, but also the—

- personnel files (loss files);
- hospital files (all inpatient and a majority of outpatient deaths are recorded);
- safety databases (unintentional injury deaths are recorded with substantial free text); and
- HRA survey (adding risk-taking behavior).

Since each data set contains somewhat different information on the same individuals and events, more comprehensive study is possible than with any individual sources of data alone.

Inquiry 1: Hospitalization Risk by Army Military Occupational Specialty.*

- **Background.** Women and men in the Army represent a very heterogeneous population engaged in diverse occupational activities, each with unique hazards and physical demands. While some jobs are still closed to women, most are now available to both genders. Many factors influence risk of hospitalization. One unique attribute of the DoD hospitalization databases is that they include all hospitalization records whether the problem is duty related or not. An additional strength of the TAIHOD database is not only its ability to study groups of soldiers based on their major occupational category, but also to compare women and men *within* occupational groups based upon their individual characteristics and health habits.

- **How TAIHOD Was Used.** To evaluate injury and illness hospitalization risk for women and men populating the largest occupational specialties, the following preliminary analysis was conducted:
  - All soldiers on active duty between CY 1990 and 1994 were selected from the DMDC database. A subset comprised of the 25 largest MOSs was then selected for study. Each individual's length of service during the interval was calculated to determine the denominator (person years contributed). Occupational subgroups were created using the first three digits of the MOS.
  - Hospitalizations for all injury and musculoskeletal conditions from the IPDS were linked to the population DMDC data to create the numerator. Because of the relative importance of pregnancy-related hospitalizations for women, these hospitalization rates were included for comparison.

* Amoroso, P.J, M.M. Yore, G.S. Smith, and M. Lopez. Analysis of Military Occupational Specialties and Hospitalizations. Part I. The 25 Largest Army Enlisted Occupations. USARIEM Technical Report T98-7, Natick, MA, November 1997.

! **Results.** Excerpts of the key results are presented in **Table 8-2**.

- The male occupation with the highest hospitalization rates for both injury and musculoskeletal conditions was infantry (11B).
- For women, injury hospitalizations were highest among medical specialists (91A), while hospitalizations for musculoskeletal conditions were highest among light-wheeled mechanics (63B).
- There was substantial variation between occupational groups and between genders, undoubtedly reflecting both risk exposure differences and the varied demographic composition of these occupational groups.

Table 8-2. Hospitalization Rates for the Largest 25 Military Occupational Specialties, CY 1990-1994

Duty MOS Codes and Categories	Sex	Rates of Hospitalization* by Primary Diagnosis/ICD-9 Codes			Other Hospital	Total Hospitalization Rate*
		800-904.99, 910-957.99, 960-995.99 (Injury/Poisoning)	710-739 (Musculoskeletal)	630-676.9 (Pregnancy)		
11B, Infantry	Male	260	248	—	838	1346
11C, Infantry	Male	221	194	—	720	1135
11H, Infantry	Male	221	234	—	729	1184
11M, Infantry	Male	224	173	—	725	1122
12B, Combat Engineering	Male	230	206	—	874	1310
13B, Field Artillery	Male	214	191	—	818	1223
13F, Field Artillery	Male	212	214	—	767	1192
19D, Armor	Male	227	184	—	738	1149
19K, Armor	Male	221	187	—	748	1156
31C, Communications--Electronic Maintenance	Male	178	187	—	823	1188
	Female	138	248	1379	1751	3515
	Overall	174	194	—	925	1444
31K, Communications--Electronic Operations	Male	168	155	—	853	1176
	Female	122	308	1655	1793	3878
	Overall	165	164	—	904	1322
52D, Power Generation Equipment Repairer	Male	168	195	—	780	1142
	Female	139	293	1114	1642	3189
	Overall	166	200	—	820	1237
54B, Chemical	Male	176	228	—	882	1285
	Female	146	308	1186	1807	3447
	Overall	173	235	—	964	1477
63B, Mechanical Maintenance	Male	155	221	—	823	1198
	Female	134	310	1412	1881	3737
	Overall	153	227	—	902	1388

Table 8-2.—*Continued*

Duty MOS Codes and Categories	Sex	Rates of Hospitalization* by Primary Diagnosis/ICD-9 Codes			Other Hospital	Total Hospitalization Rate*
		800-904.99, 910-957.99, 960-995.99 (Injury/Poisoning)	710-739 (Musculoskeletal)	630-676.9 (Pregnancy)		
63H, Mechanical Maintenance	Male	137	236	—	736	1109
	Female	63	213	1485	2022	3783
	Overall	133	235	—	806	1254
71L, Administration	Male	117	205	—	862	1184
	Female	79	196	1244	1503	
	Overall	100	201	—	1150	
75B, Personnel Administration Specialist	Male	125	195	—	746	1066
	Female	86	190	1316	1479	3071
	Overall	115	194	—	929	1567
76C, Supply	Male	147	182	—	872	1200
	Female	120	206	1732	1653	3711
	Overall	141	187	—	1054	1784
76Y, Supply	Male	144	194	—	845	1182
	Female	92	207	1423	1690	3411
	Overall	132	197	—	1027	1662
77F, Petroleum Supply Specialist	Male	173	199	—	926	1298
	Female	179	222	1487	1875	3763
	Overall	175	203	—	1109	1773
88M, Motor Transport Operator	Male	190	217	—	886	1293
	Female	143	241	1475	1813	3671
	Overall	183	220	—	1017	162.9
91A, Medical	Male	238	207	—	1235	1679
	Female	206	300	1531	2465	4502
	Overall	231	227	—	1499	2287

Table 8-2—*Continued*

Duty MOS Codes and Categories	Sex	Rates of Hospitalization* by Primary Diagnosis/ICD-9 Codes			Other Hospital	Total Hospitalization Rate*
		800-904.99, 910-957.99, 960-995.99 (Injury/Poisoning)	710-739 (Musculoskeletal)	630-676.9 (Pregnancy)		
91B, Medical	Male	168	248	—	1079	1495
	Female	124	281	1356	2082	3843
	Overall	160	254	—	1264	1928
94B, Food Service	Male	158	192	—	1035	1384
	Female	142	192	1557	1810	3701
	Overall	154	192	—	1198	1873
95B, Law Enforcement	Male	153	204	—	791	1147
	Female	153	240	1166	1626	3185
	Overall	153	207	—	878	1360
All MOS Codes and Categories	Male	196	209	—	841	1246
	Female	120	228	1378	1743	3469
	Overall	189	211	—	930	1465

* Rates per 10,000; 1.28 million person years for men and 140,000 person years for women over the 5-year period. Individuals can be hospitalized more than once.

Source: TAIHOD query using DMDC and IPDS/PASBA data.

This work was supported by Defense Women's Health Research Program (Army Medical Research and Materiel Command) grant W4168044.

Inquiry 2: An Evaluation of the Risk Associated with Assignment to an Airborne Unit.*

- **Background.** Military parachuting remains one of the most hazardous activities for Army soldiers. Presently, close to 40,000 soldiers are assigned to jobs that require frequent parachute jumps (at least once per quarter). Airborne soldiers submit to more rigorous selection criteria in qualifying for airborne assignment, endure vigorous training programs, and are expected to maintain a high degree of physical fitness. Because these soldiers are also provided hazardous duty pay in recognition of their unique risks, they can be identified and isolated for comparison to other occupational groups of soldiers in the Army.

- **How TAIHOD Was Used.** The risk of hospitalization among airborne infantry soldiers was compared to the risk among an equivalent group of nonairborne infantry soldiers. Several components of the TAIHOD were linked to perform the analysis:
  - Hazardous duty files from the DMDC pay file database were used to identify soldiers exposed to regular parachute jumps.
  - Demographic variables from the DMDC personnel master files were used to identify a comparison group of infantry soldiers of similar MOS who are not exposed to parachuting.
  - All hospitalization records for both groups of these infantry soldiers were linked to the demographic and pay records in order to calculate hospitalization rates for various causes.

* Bricknell, M.C.M., P.J. Amoroso, and M.M. Yore. What is the risk associated with being a qualified military parachutist? *Occupational Medicine* 49(3):139-145, 1999.

- **Results.** Hospitalization for all causes was analyzed. The top 20 causes of hospitalization among infantry soldiers (parachutists vs. nonparachutists) for CY 1990-1994 are summarized in **Table 8-3**. The results indicate that parachute-qualified soldiers do indeed have higher rates of injury hospitalization, especially for head injuries, ankle fractures, and back injuries. These excess injuries appear to be related to parachuting, combat, and aircraft operations. As shown in **Table 8-4**, overall hospitalizations may be slightly lower than among their infantry counterparts, with significantly fewer hospitalizations for mental illness. This may reflect the generally higher level of health required for selection and sustained qualification for this elite duty.

Table 8-3. Rates of Top 20 Causes of Hospitalization Among Infantry Soldiers (Parachutists vs. Nonparachutists), CY 1990-1994

Causes of Hospitalization	Parachutists*			Nonparachutists†			Relative Risk§	95% Confidence Intervals
	Number	Rate Per 10,000 Person Years‡	Rank	Number	Rate Per 10,000 Person Years‡	Rank		
Internal derangement of the knee	348	58	1	1409	52	1	1.12	1.00-1.26
Other derangement of joint	219	37	2	800	30	6	1.24	1.07-1.44
Intracranial injury	214	36	3	294	11	25	3.30	2.77-3.94
Inguinal hernia	188	32	4	931	35	4	0.92	0.78-1.07
Fracture of the ankle	180	30	5	287	11	27	2.85	2.36-3.43
Adjustment reaction	159	27	6	1245	46	2	0.58	0.49-0.68
Disorder of tooth development and eruption	151	25	7	912	34	5	0.75	0.63-0.89
Alcohol dependence syndrome	143	24	8	1199	44	3	0.54	0.46-0.64
Other cellulitis and abscess	116	20	9	371	14	17	1.42	1.15-1.75
Other disorders of synovium, tendon, bursa	112	19	10	501	19	9	1.01	0.83-1.24
Pneumonia unspecified	105	18	11	547	20	7	0.87	0.71-1.07
Other disorders of bone and cartilage	104	18	12	433	16	11	1.09	0.88-1.35
Other non-infectious gastroenteritis and colitis	103	17	13	376	14	15	1.24	1.00-1.55
Fracture of vertebral column without mention of spinal cord injury	98	17	14	140	5	57	3.18	2.45-4.11
Other and unspecified disorders of joint	93	16	15	389	14	14	1.08	0.87-1.36
Effect of heat and light	92	15	16	206	8	39	2.03	1.59-2.59
Fracture of the face bones	86	14	17	329	12	21	1.19	0.94-1.50

Table 8-3.—*Continued*

Causes of Hospitalization	Parachutists*			Nonparachutists†			Relative Risk§	95% Confidence Intervals
	Number	Rate Per 10,000 Person Years‡	Rank	Number	Rate Per 10,000 Person Years‡	Rank		
Deviated nasal septum	84	14	18	286	11	29	1.33	1.05-1.70
Intervertebral disc disorders	81	14	19	441	16	10	0.83	0.66-1.06
Injury, other and unspecified	79	13	20	201	7	43	1.78	1.38-2.31

* Parachutists = soldiers in receipt of parachute pay.
† Nonparachutists = soldiers not in receipt of parachute pay.
‡ A total of 329,794 person years were accounted for; of these, 18% were in the parachutist group. Individuals can be hospitalized more than once.
§ Relative risk of hospitalizations = hospitalization rate for parachutists/hospitalization rate for nonparachutists.
Source: TAIHOD query using DMDC and IPDS/PASBA data.

Table 8-4. Comparisons of Seven Top Hospitalization Causes Among Infantry Soldiers (Parachutists vs. Nonparachutists) by Major ICD-9 Diagnostic Group, CY 1990-1994

Major ICD-9 Diagnostic Group, Top Seven Code Groups	ICD-9 Codes	Parachutists*		Nonparachutists†		Relative Risk§	95% Confidence Interval
		Number of Hospitalizations‡	Hospitalization Rate‡ (n/10,000 person-years)	Number of Hospitalizations‡	Hospitalization Rate‡ (n/10,000 person-years)		
Injury	800-999	2,165	364	6,580	243	1.49	1.42-1.57
Musculoskeletal System	710-739	1,305	219	6,100	226	0.97	0.92-1.03
Digestive System	520-579	767	129	4,309	159	0.81	0.75-0.87
Respiratory System	460-519	587	99	3,199	118	0.83	0.76-0.91
V Codes‖	V01-V82	505	85	1,651	61	1.39	1.26-1.53
Mental Disorders	290-319	454	76	3,896	144	0.53	0.48-0.58
Infectious & Parasitic	001-139	379	64	1,934	72	0.89	0.80-0.99
All Hospitalizations #	—	7,378	1239	34,194	1265	0.98	0.96-1.00

* Parachutists = soldiers in receipt of parachute pay.
† Nonparachutists = soldiers not in receipt of parachute pay.
‡ A total of 329,794 person years were accounted for; of these, 18% were in the parachutist group. Individuals can be hospitalized more than once.
§ Relative risk of hospitalizations = hospitalization rate for parachutists/hospitalization rate for nonparachutists.
‖ Supplementary classification includes nonspecific follow-up exams, vasectomy, and “other orthopedic aftercare.”
Total reflects all hospitalizations for each group including those in major ICD-9 groups not displayed in this table.
Source: TAIHOD query using DMDC and IPDS/PASBA data.

Inquiry 3: The Association Between Seat Belt Use and Hospitalization for Motor Vehicle Crashes

- **Background.** Motor vehicle crashes remain one of the most important causes of injury and death for men and women in the military. Seat belts are a proven method for reducing injury in motor vehicle crashes. While seat belt usage among military service members is generally high, almost 40 percent of soldiers taking the HRA in CY 1992 admitted to wearing them less than 100 percent of the time. Low seat belt usage may contribute to injury either because the likelihood of injury given a crash is greater, or because admitting to low rates of use may indicate greater risk-taking behavior and therefore a greater likelihood of a crash.
- **How TAIHOD Was Used.** This behavioral choice was chosen for study because it has been shown to lend itself particularly well to intervention. The following components of the TAIHOD were queried:
  - Health Risk Appraisal Survey database. All survey respondents in CY 1992 were chosen for the study. Responses to the question "What percentage of the time do you usually buckle your safety belt when driving or riding?" were analyzed.
  - Demographic variables from the DMDC personnel database were used to determine age, rank, gender, and if and when respondents left Army service.
  - Hospitalization for STANAG injury cause codes related to private motor vehicles from CY 1992 (starting with their survey date) through December 1997 were matched to HRA records of the respondents.

- **Results.** Respondents were grouped into three categories based upon their reported percentage of seat belt usage. Approximately 64 percent reported 100 percent usage, 25 percent reported usage between 51 and 99 percent, and 11 percent reported usage of 50 percent or less. Low rates of seat belt usage were associated with significantly greater risk of injury. The low usage group was shown to have over twice the risk of injury hospitalization than the group who claimed 100 percent seat belt usage. **Table 8-5** summarizes the findings.

Table 8-5. Association Between Reported Seat Belt Use and Hospitalization for Motor Vehicle Crashes, CY 1990-1994

Seat Belt Usage (% of time)	Number	Percentage of Total	Number Hospitalized	Rate/10,000	Odds Ratio (95% Confidence Intervals)
100%	60,391	64%	187	31	—
51-99%	24,041	25%	107	45	1.4 (1.1, 1.8)
0-50%	10,491	11%	70	67	2.2 (1.6, 2.8)

Source: TAIHOD query using DMDC, IPDS/PASBA, and HRA data.

Bell, N.S.; Amoroso, P.J., M.M. Yore, G.S. Smith, and B.H. Jones. "Self-reported Risk-Taking Behaviors and Hospitalization for Motor Vehicle Injury Among Active Duty Army Soldiers," unpublished. This work was supported by NIAAA grant 1R29AA11407-01A1 and Defense Women's Health Research Program (Army Medical Research and Materiel Command) grant W4168044.

Inquiry 4: Risk Factors for Completed Suicide in the U.S. Army

- **Background.** As documented in Chapter 2, suicide is a significant cause of premature death in the U.S. Army (as well as the other services). Though suicide is preventable, high-risk individuals are often difficult to identify. The HRA survey has already been given to well over 500,000 active duty Army soldiers. Linking these self-reported data to deaths allows a number of potential risk factors to be assessed and potential intervention opportunities to be identified.

- **How TAIHOD Was Used.** The relationship of selected self-reported measures of social support, job satisfaction, and alcohol and tobacco use were analyzed as predictors of suicide-related death. To accomplish this analysis, several components of the TAIHOD were linked:
  - All active duty Army soldiers who took the HRA between CY 1989 and 1997 were followed in a retrospective cohort study.
  - The DMDC personnel master files were used to verify the active duty status of the respondents.
  - The casualty database (ACIPS) was linked to the records of the HRA takers to identify all suicides from CY 1989-1997.

- **Results.** Preliminary analyses suggest that multiple HRA questions predict risk of suicide. Several of these associations are displayed in **Table 8-6**. The results in Table 8-6 demonstrate that self-reported health status measures can be linked to real outcomes, in this case, self-inflicted injury resulting in death. Advanced analyses (combining responses to multiple questions) will attempt to develop sophisticated prediction models to identify high-risk individuals for immediate intervention, preferably at the point of survey completion.

Table 8-6. Responses on the Health Risk Appraisal and Risk of Suicide*

Questions		Number of Respondents	Number of Deaths	Odds Ratio	95% Confidence Interval
Gender:	Female	69,671	5	—	—
	Male	438,071	139	4.6	(2.0, 10.0)
Rank:	Officer/Warrant	91,138	7	—	—
	Enlisted	349,218	134	5.0	(2.3, 11.7)
Personal misfortune	None	189,949	41	—	—
in the past year?	Some/few	255,007	74	1.3	(0.9, 2.0)
	Several	56,074	29	2.4	(1.5, 4.0)
Family problems?	Never	181,432	37	—	—
	Sometimes	81,930	34	1.4	(0.9, 2.1)
	Often	18,497	11	2.9	(1.4, 6.0)
People to turn to?	Always	307,078	67	—	—
	Sometimes	39,501	17	2.0	(1.1, 3.4)
	Never	11,453	9	3.6	(1.7, 7.5)
Is life overwhelming?	Never	463,154	122	—	—
	Sometimes	24,390	16	2.5	(1.4, 4.3)
	Often	2,791	3	4.1	(1.3, 12.8)
Cigarette use?	Never	288,533	53	—	—
	Ex-smoker	77,359	25	1.8	(1.1, 2.9)
	Current smoker	141,547	67	2.6	(1.8, 3.8)
Considered suicide?	No	488,568	130	—	—
	Yes	11,810	14	4.5	(2.5, 8.0)
Do friends worry about	No	403,193	114	—	—
your drinking?	Yes	9,851	11	4.0	(2.0, 7.6)

* This work in progress represents a collaborative effort with researchers at USARIEM, SSDS, Inc., and the Harvard Injury Control Research Center, and is supported by NIAAA grant 1R29AA11407-01A1, PHS/CDC grant R49/CCR115279-01 and Defense Women's Health Research Program (Army Medical Research and Materiel Command) grant W4168044.

8-8. Other Uses of the TAIHOD.

The resources presently devoted to prevent and control injuries among service members are relatively small, in part because quantification of the impact on the mission, readiness, and overall health of the Armed Forces is such a difficult challenge. Currently available tools were simply not available 5 or 10 years ago. The Army, as well as the other services, does an excellent job of collecting quality data on various populations; however, much of these data have been collected for purely administrative purposes. The TAIHOD affords an opportunity to make further use of these data sources for research purposes and serves as a model comprehensive research database for the development of future research databases in the public and private sectors.

Researchers will be able to do the following:

- Document the incidence, prevalence, and trends of injury among female and male soldiers by diagnostic category and location/body part.
- Document important causes of injuries.
- Determine the subpopulations at greatest risk of injury, including high-risk MOSs.
- Determine the relative morbidity and mortality from injuries vs. illness or disease.
- Estimate the direct and indirect costs associated with injuries and illnesses.
- Demonstrate the relationship between self-reported health habits and actual outcomes.
- Compare the Army rates of injury to nationally established population health objectives (Healthy People 2000 objectives).
- Identify important causes of premature discharge from the service.
- Recommend to policy makers and commanders injury and illness prevention program development, appropriate surveillance targets, and future research focus.
- Firmly establish a research database capable of informing research scientists of actual population outcomes prior to initiation of research on military populations.